Austrobaileya 3(4): 643–659 (1992)

THE GENUS *LEPTOSPERMUM* FORST. ET FORST. F. (MYRTACEAE) IN NORTHERN AUSTRALIA AND MALESIA

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Summary

An annotated list of the 31 *Leptospermum* species accepted for northern Australia and Malesia is provided. *L. madidum* A. Bean replaces the illegitimate name *L. longifolium* (C. White & Francis) S.T. Blake. Two new species, *L. pallidum* and *L. venustum*, and one new subspecies, *L. madidum* subsp. *sativum*, are described. *L. amboinense* Blume is reinstated at species level, and *L. petersonii* subsp. *lanceolatum* J. Thompson is synonymised with it. A multi-access key and a dichotomous key to the 31 species are provided. Significant distributional data additional to Thompson's revision are given.

Introduction

Leptospermum is characterised within the family Myrtaceae by its flowers with a single whorl of free stamens which are shorter than the petals, its versatile anthers, capsular fruits and alternate leaves.

A revision of the genus *Leptospermum* was recently published by Joy Thompson (Thompson 1989), which elucidated many matters of concern to taxonomists and provided a basis for further research. Readers are referred to that publication for descriptions and full synonymy of species not treated in this paper.

The purpose of this paper is twofold: (a) to describe two new species from Queensland, and one new subspecies from Northern Territory and Western Australia, and (b) to deal with taxonomic problems which remain in two northern Australian and Malesian species groups, i.e. the informal *L. brachyandrum* and *L. petersonii* subgroups of Thompson (1989), in particular the circumscriptions of *L. parviflorum* Valeton and *L. javanicum* Blume.

L. parviflorum sensu Thompson and *L. javanicum sensu* Thompson are heterogeneous. Thompson's concept of *L. parviflorum* includes all rheophytic *Leptospermum* species from New Guinea and far northern Australia. However, typical *L. parviflorum* from New Guinea is quite different from the Australian taxon. *L. parviflorum* s. str. has leaves which are dark green above, densely pubescent below, with strongly recurved margins on dried material; the floral hypanthia are densely pubescent, and stem flanges are present and conspicuous. The Australian material has leaves which are pale green, concolourous, glabrous to sparsely pubescent, margins not recurved, floral hypanthia sparsely pubescent, and stem flanges absent. This taxon has been known as *L. longifolium* (C. White & Francis) S.T. Blake but that name is illegitimate and is replaced here by *L. madidum* A. Bean. Populations of *L. madidum* from Northern Territory and Western Australia have much narrower leaves and smaller fruits than those on other populations and have been separated as a subspecies, *L. madidum* subsp. *sativum* A. Bean.

Thompson has applied the name *L. javanicum* to all woody-fruited Malesian *Leptospermum* species except the Mt Kinabalu population of *L. recurvum* Hook. The type of *L. javanicum* has broad obovate discolourous leaves, pubescent floral hypanthia and fruits measuring 4–5 × 6–7 mm. While many specimens do match this description, it is clear that many presently identified as *L. javanicum* do not, and that they represent a distinct taxon, differing clearly from *L. javanicum* by its narrower lanceolate leaves (concolourous or nearly so), mostly glabrous floral hypanthia and fruits measuring 3–4 × 4.0–5.5 mm. The type of *L. amboinense* Blume belongs in this taxon so that name is reinstated here for it.

L. amboinense is widespread in Malesia, even more so than *L. javanicum*, and also extends to north Queensland. While these two species are clearly in the same

subgroup, *L. amboinense* is most closely related to *L. petersonii* Bailey and is identical with *L. petersonii* subsp. *lanceolatum* J. Thompson. In view of the altered circumscription of *L. javanicum* and *L. parviflorum* accepted here, these species are described fully in the text, as are the reinstated species *L. amboinense* and *L. madidum.*

In the annotated species list provided, species are arranged in natural order as perceived by the present author. This is similar to a subset of that used by Thompson (1989), particularly in the placement of major groups. However I have changed the position of some species. For example, *L. lamellatum* is placed next to *L. trinervium* on the basis of its brown, papery bark and seeds with small lateral wings. *L. liversidgei* is removed from the *L. petersonii* subgroup because it appears to have little in common with that group; for example, it lacks stem flanges, its sepals possess very few hairs, and the bark is grey and scaly. In contrast, the species in the *L. petersonii* subgroup have prominent stem flanges, their sepals possess hairs on the margins and apex, and the bark is brown and fibrous.

For the purposes of this paper, northern Australia is defined as including Queensland, Northern Territory and that part of Western Australia which lies north of the 26th parallel. Malesia is the area defined for the Flora Malesiana project (van Steenis-Kruseman 1950), and includes the Malay peninsula, Sumatra, Borneo, Java, Philippines, Sulawesi, Moluccas and New Guinea. The genus *Leptospermum* does extend slightly beyond Malesia into southern Burma (Corner 1940).

Diagnostic Attributes

Two characters useful in the identification of *Leptospermum* species, the presence/absence of stem flanges and seed morphology, are worthy of brief review.

Stem flanges

One of the most diagnostic of vegetative characters in *Leptospermum* is the presence or absence of stem flanges. This term was introduced by Thompson (1989) and refers to the raised ridges of tissue on the branchlets of many *Leptospermum* species, extending from the base of each leaf (**Fig 1A.**). Stem flanges had been noted previously, as 'angular' or 'triangular' twigs for *L. javanicum* (Corner 1940; Backer & Bakhuizen Van Den Brink 1963; van Steenis 1972), and for *L. wooroonooran* (Bailey 1900). Stem flanges are consistently either present or absent for a given species, and when present they are readily visible with a hand lens. In *L. sericatum*, the flanges are present but poorly developed. Stem flanges are not confined to the genus *Leptospermum*. Of the genera in the *Leptospermum* suballiance of Briggs and Johnson (1979), stem flanges are present in *Homalospermum* and *Pericalymma* (both monotypic genera), they are consistently absent in *Neofabricia* and *Asteromyrtus*, while in *Agonis* and *Kunzea* stem flanges are present in some species but not others e.g. they are prominent in *Kunzea graniticola* Byrnes but absent in *K. opposita* F. Muell.

Seed morphology

The seeds of most of the northern *Leptospermum* species have been examined in the present study. In most cases, seeds were collected from plants in their natural habitat, rather than from herbarium specimens. Thus, seed maturity could be properly assessed. *Leptospermum* species can be placed into two broad groups according to the characteristic of their seeds. 1. Fertile and infertile seeds are identical in appearance, being linear and striate. Germination tests have revealed that each seedlot comprises a mixture of fertile seeds and unfertilised 'chaff'. In this group are all the 'woody-fruited' species e.g. *L. polygalifolium*, and also *L. pallidum*. 2. Seeds and chaff are usually readily distinguishable, the seeds being obovoid to cuneate with a reticulate surface, and the chaff narrower and paler. This group comprises the 'soft-fruited' species, and the seed characters are heterogeneous. Seeds of *L. venustum* and *L. semibaccatum* are dark brown, conspicuously reticulate, and only twice as long as wide. *L. microcarpum* seeds are quite black, while seeds of *L. trinervium* have rows of extended cells forming small lateral wings.

The Species

1. Leptospermum pallidum A. Bean **sp. nov.** affinis *L. madido* A. Bean a quo cortice aspera, pedicellis longioribus, fructibus majoribus 5-valvibus, seminibus linearibus, habitatione in summis collium differt. **Typus:** Marble Creek mesa, SE of Greenvale, 19°07′S, 145°04′E, 20 April 1991, *A.R. Bean* 2949 (holo: BRI; iso: CANB,K, MEL,NSW).

Spreading shrub to 3 metres high; bark rough, grey, longitudinally fissured, closely adhering, persistent throughout; branchlets virtually glabrous, stem flanges absent. Leaves alternate, sessile or with petioles up to 2 mm long, concolourous, pale yellowish-green, narrow-lanceolate, 35–52 × 5–9 mm, more or less triplinerved, oil glands numerous, conspicuous; leaf base cuneate, apex acute to acuminate; young leaves with sparse long hairs on underside, glabrescent. Inflorescence comprising bracteolate monads on condensed axillary shoots, 2–3 flowers on each shoot, often appearing to arise directly from leaf axils; floral bracts and bracteoles shed in early stages of bud development. Flowers 10–15 mm in diameter; pedicels 9–12 mm long, with bracteole scar approximately midway along pedicel; hypanthium glabrous, 1.5–2.0 mm long; sepals obtuse, glabrous, oil dots conspicuous; petals white, orbicular, 3–5 mm long; stamens shorter than petals, 30–40 in a single whorl; anthers versatile, cells parallel, opening by narrow slits; gland conspicuous, globular; style inset, stigma broad, capitate; roof of ovary glabrous, ovary 5-locular. Fruits dry, conspicuously domed above hemispherical base, 5-locular, 4.5–5.0 × 5–6 mm, sepals persistent. Seeds and chaff identical, pale brown, linear, striate, 2.0–2.5 mm long, 0.2 mm wide. **Fig 1.**

Specimens examined: Queensland. BURKE DISTRICT: Porcupine Gorge, Apr 1988, *Fell* DF796 (BRI). NORTH KENNEDY DISTRICT: 20 km east of Greenvale, May 1989, *Fell* DF1809, DF1810 (BRI); beside Charters Towers-Greenvale road, 32.3 km from Greenvale, Jun 1989, *Bean* 1068 (BRI); Marble Creek mesa, SE of Greenvale, Apr 1991, *Bean* 2942 (BRI,DNA,MEL,NSW).

Distribution and habitat: *L. pallidum* has a restricted distribution in northern Queensland, mostly in the Greenvale area, but also at Porcupine Gorge, north of Hughenden. It occurs on lateritic ridges, often on cliff edges with skeletal soil. It sometimes grows near vine-thicket communities on rocky slopes. Associated species include *Eucalyptus exserta* F. Muell., *E. similis* Maiden, *E. persistens* L. Johnson & K. Hill, *E. lamprophylla* Brooker & A. Bean, *Myrtella microphylla* (Benth.) A.J. Scott and *Triodia* sp.

Flowering period: March – June.

Affinities: *Leptospermum pallidum* shows some resemblance to species in the genus *Neofabricia* J. Thompson by virtue of its rough grey bark, large leaves and domed fruits. However, *L. pallidum* lacks all of the most diagnostic characters of *Neofabricia*, which are the very numerous stamens in several irregular whorls, the dorsifixed anthers and the winged seeds (Thompson 1983). Hence it clearly belongs in *Leptospermum* but it has no very close relatives there. It is probably closest to *L. madidum* but differs from that species by its rough bark, longer pedicels, larger 5-valved fruits, linear seeds and ridgetop habitat.

Conservation status: Suggested status is 3RC, as defined by Briggs and Leigh (1988).

Etymology: Named for the pale colour of the leaves.

2. Leptospermum madidum A. Bean, **nom. nov.**

Agonis longifolia C. White & Francis, Bot. Bull. Dept. Agr. & Stock, Queensland 22: 18 (1920). **Type:** Endeavour River, ?*Persieh* (holo: BRI, iso: NSW).

Leptospermum longifolium (C. White & Francis) S.T. Blake, Proc. Roy. Soc. Queensland 69: 81 (1958), nom. illeg.; non *L. longifolium* Cunn. in Heward, R., Hooker's Journal of Botany 4: 243 (1841).

Shrub or tree to 8 m high, ultimate branches pendulous; bark smooth and deciduous throughout, white, creamy or pink; branchlets sparsely pubescent, glabrescent, stem flanges absent. Leaves alternate, sessile, concolourous, pale green, linear, 22–70 × 1–9 mm, apex acute or acuminate; appressed indumentum present on young leaves, but older leaves generally glabrous. Inflorescence axillary, consisting of several bracteolate

monads; floral bracts shed before anthesis. Flowers 5–7 mm in diameter; pedicels 1 mm long, hypanthium sparsely pubescent, 2–3 mm long; sepals obtuse, margins ciliate; petals white; anthers versatile, cells parallel; style inset, stigma capitate; roof of ovary mostly glabrous but with hairs at base of style and along valve margins; ovary 3-locular. Fruit thin-walled, glabrous, hemispherical, 3-locular, 2–3 × 2.5–5.0 mm, sepals persistent. Seeds light brown, obovoid to elliptical, reticulate, c. 0.75 × 0.3 mm; unfertilised seeds linear to narrowly cuneate.

Flowering period: July – October.

Affinities: *L. madidum* (as *L. longifolium*) was included within *L. parviflorum* Valeton by Thompson (1989). However, *L. madidum* can be readily distinguished from that species by the lack of stem flanges, pale concolourous leaves which are glabrous or only sparsely pubescent, leaves not recurved when dried, the glabrous or sparsely pubescent floral hypanthium and the larger fruits.

Two subspecies are recognisable as follows:

1. Leaves 4.5–9.0 mm wide; fruits 3.5–5.0 mm in diameter . . . . subsp. **madidum**
   Leaves 1.0–4.5 mm wide; fruits 2.0–3.5 mm in diameter . . . . . subsp. **sativum**

L. madidum subsp. **madidum**

Leaves linear to narrow-lanceolate, 38–70 × 4.5–9.0 mm, pale green. Fruits glabrous, hemispherical, 2.5–3.0 × 3.5–5.0 mm.

Selected specimens: Queensland. Cook District: bank of Jardine River, Oct 1979, *Scarth-Johnson* 893A (BRI); north bank of Olive River, near mouth, Sep 1974, *Tracey* 14495 (BRI); 60 km west of Strathmay on Musgrave to Edward River road, Oct 1980, *Clarkson* 3498 (BRI,CANB,DNA,K,L,MO,NSW,PERTH,QRS); 10 km SE of Edward River Settlement, Oct 1983, *Garnett* ER497 (JCT); Archer River, beside main Cape York road, Jun 1988, *Bean* 845 (BRI,NSW); Wenlock, Batavia River, Jul 1948, *Brass* 19699 (BRI); Big Bend in Coen River, 2 km N of Coen, Aug 1989, *Jobson* 733 (BRI,NSW); Hann River, Qld, Aug 1975, *Staples* IBS2167 (BRI,CANB,K); 15 km east of 'Violet Vale' HS., Aug 1978, *Paijmans* 2866 (BRI); Endeavour River, north arm crossing with McIvor R.-Cooktown road, Nov 1981, *Irvine* 2175 (QRS).

Distribution and habitat: *L. madidum* subsp. *madidum* is confined to Cape York peninsula, from Bamaga to Cooktown. It occurs on the banks of freshwater creeks and rivers, in sandy soils.

L. madidum subsp. **sativum** A. Bean **subsp. nov.** a *L. madido* subsp. *madido* foliis angustioribus, fructibus parvioribus differt. **Typus:** Northern Territory. Margaret River, 21 September 1946, *S.T. Blake* 17075 (holo: BRI; iso: DNA).

Leaves linear, 20–45 × 1.0–4.5 mm, pale green. Fruits glabrous, hemispherical, 2.0–2.5 × 2.0–3.5 mm.

Selected specimens: Western Australia. Picaninny Creek gorge, 15 km SE of Bungle Bungle outcamp, East Kimberley, Jul 1984, *Kenneally* 9301 (CANB,NSW,PERTH); Bream Gorge, Osmund Valley station, East Kimberley, Nov 1989, *Menkhorst* 748 (DNA,MEL,PERTH). **Northern Territory.** Finnis River, Aug 1969, *Byrnes* 1684 (BRI,DNA); Jim Jim Falls, Sep 1984, *Dunlop* 6747 & *Wightman* (AD,DNA); Sawtooth Gorge, Nov 1972, *Byrnes* 2822 & *Martensz* (BRI); Wooler River, 16 km northwards of Telecom road on Marparu outstation road, Sep 1987, *Clarke* 1469 (DNA,NSW); Darwin area, Feb 1990, *Wightman* 4960 (BRI,DNA); Cobourg Peninsula, Jul 1982, *Dunlop & Wightman* 108 (DNA).

Distribution and habitat: *L. madidum* subsp. *sativum* occurs in the eastern part of the Kimberley region of Western Australia and throughout the northernmost part of the Northern Territory. It grows along riverbanks, and has often been recorded from sandstone gorges, but it is not confined to them.

Etymology: The subspecific epithet refers to the fact that this taxon has become widely cultivated in recent years.

Note: This taxon has been widely cultivated in northern Australia for several years. According to Brock (1988), it is fast growing and adapts to a wide range of well-drained soils.

3. Leptospermum brachyandrum (F. Muell.) Druce, Bot. Soc. Exch. Club British Isles 1916 Suppl. 2: 632 (1917); *Kunzea brachyandra* F. Muell., Fragm. 2: 27 (1860). **Type:** New South Wales. ad ripas fluminis Hastings, *Dr. Herman Beckler* (lecto: NSW *n.v.*; isolecto: A!).

Additional specimens: Queensland. COOK DISTRICT: Turtle Rock, 12 km SSE of Laura, Nov 1991, *Bean* 3805 (BRI,QRS). NORTH KENNEDY DISTRICT: Mt Stuart, 9 km S of Townsville, Dec 1991, *Bean* 3867 (BRI,MEL,QRS); Cockatoo Creek area, Mt Elliot, south of Townsville, Aug 1991, *Bean* 3588 (BRI,CANB,K,L,MEL,NSW,PERTH); Mingela Bluff, about 10 km E of Mingela, Sep 1989, *Cumming* 9294 (BRI); Cape Upstart peninsula, Jun 1967, *Hinson* CU4 (BRI); Stonehaven Bay, Hook Is., Jul 1985, *Warrian* CW706 (BRI).

Distribution and habitat: *L. brachyandrum* has a discontinuous distribution from northern New South Wales to northern Queensland, generally along rivers and creeks. However, in several localities in North Queensland (examples cited above), it inhabits steep rocky slopes or even cliff-faces. The hillside plants are completely smooth-barked, while the creek-dwelling plants almost always have rough bark at their bases, but in other respects, they do not appear to differ in any significant way. The respective habitats, while seemingly very different, are alike in that they are protected from fire. Perhaps this is an important determinant of its distribution.

4. Leptospermum parviflorum Valeton, Bull. Dep. Agric. Indes Neerl. 10: 39 (1907); Icon. Bogoriense 3: 93, t. 238 (1907). **Type:** New Guinea. Archip. Ind. G. Syap., *Wichmann* 52 (holo: L!).

Shrub or tree, 3–12 metres high. Bark type not recorded by collectors but appearing smooth and deciduous on herbarium specimens; young branchlets pubescent, stem flanges present, conspicuous. Leaves alternate, sessile, discolourous, linear, 20–45 × 2.0–4.5 mm, apex acute to acuminate, margins recurved in dried material, 'dark green' (*fide Foreman* LAE60470, *Van Royen* 4798) above, the lower surface much paler, densely silky-pubescent even on older leaves. Inflorescence consisting of 3–4 axillary bracteolate monads; bracts and bracteoles brown, oblong, shed well before anthesis. Flowers 5–7 mm in diameter; pedicels 1.0–1.5 mm long; hypanthium densely pubescent, 2.0–2.5 mm long, sepals obtuse, pubescent; petals orbicular, colour unknown; stamens c. 30, with small parallel anther cells; style inset, stigma capitate; roof of ovary glabrous except for short erect hairs at base of style and along valve margins, ovary 3-locular. Fruit thin-walled, pubescent, hemispherical, 1.5–2.0 × 2.0–2.5 mm, with valves not extending above the rim of the hypanthium, 3-locular, sepals persistent. Seeds and chaff identical, brown, cuneate, striate, c. 0.8 × 0.4 mm.

Selected specimens: Indonesia. Irian Jaya. Ransiki, Feb 1957, *Mangold* 2260 (L); Boepoel to Merau R., Merauke district, Aug 1954, *Van Royen* 4798 (A,L); between Boepoel and Tanas, Aug 1956, *Leefers* BW3224 (L,SING). **Papua New Guinea.** Kewa River, Sakoer, Jul 1941, *Anta* 72 (A,L,SING); Misool, Sorong, near Fakal, Sep 1948, *Pleyte* 1082 (BRI,L,SING); 10.5 km west of Arufi, Morehead subdistrict, Jul 1974, *Foreman* LAE60470 (A,BRI,L,QRS); upper Wanggoe River basin, c. 47 miles [76 km] N of Weam Patrol Post, Aug 1967, *Paijmans* 333 (L).

Distribution and habitat: *L. parviflorum* is endemic to the island of New Guinea, occurring both in Irian Jaya and in Papua New Guinea. It grows on the banks of rivers and streams, mostly at altitudes of less than 50 metres.

Flowering period: July – September.

Affinities: *L. parviflorum* is most closely related to *L. purpurascens*. These species share the following characters; stem flanges, discolourous leaves with dense appressed hairs on leaf undersides, strongly recurved leaf margins on dried specimens and densely pubescent floral hypanthia. However, *L. parviflorum* differs by its longer leaves with acute apices.

Note: The type consists of two pieces, on separate sheets, and each has a tag bearing the number 52. The collection is undated but Valeton gave the year of collection as 1903.

5. Leptospermum purpurascens J. Thompson, Telopea 3(3): 355 (1989). **Type:** Queensland. COOK DISTRICT: 12°24′S, 143°07′E, southern end of Temple Bay in upper reaches of an unnamed creek between Glennie and Hunter inlets, 8 June 1978, *J.R. Clarkson* 2196 (holo: NSW *n.v.*; iso: BRI!).

Leptospermum sp. 'Mt Tozer', Thomas & McDonald, Rare & Thr. Plants of Qld 38 (1989).

Distribution and habitat: Endemic to a small area on Cape York peninsula in far northern Queensland, in the vicinity of Iron Range. It grows on rocky granitic hillsides.

6. Leptospermum luehmannii Bailey, Queensland Fl. 2: 592 (1900); *Agonis luehmannii* (Bailey) C. White & Francis, Bot. Bull. Dept. Agric. Queensland 22: 21 (1920). **Type:** Queensland. MORETON DISTRICT: Top of Glass House Mountain, October 1884, *F.M. Bailey* 4 (holo: BRI!).

Distribution and habitat: Endemic to skeletal slopes of trachyte hills and mountains between Elimbah and Beerwah, north of Brisbane. In recent years, this species has been reported as occurring in the Numinbah Valley (Lebler 1979; Stanley & Ross 1986; Thompson 1989). However, those records all relate to *L. trinervium* (Smith) J. Thompson (Bean 1991).

7. Leptospermum speciosum Schauer, in Walp., Rep.,Suppl. 1: 923 (1842); *Agonis speciosa* (Schauer) C. White, Proc. Roy. Soc. Queensland 53: 218 (1942). **Type:** Queensland. MORETON DISTRICT: in Nova Cambria australi, Moreton Bay, 1824, *A. Cunningham* Herb. no. 38 (?, *n.v.*), *fide* J. Thompson, Telopea 3(3): 357 (1989).

Distribution and habitat: Confined to coastal areas from Fraser Island in Queensland to Iluka in northern New South Wales, growing in swamps or heathlands.

8. Leptospermum whitei Cheel, J. & Proc. Roy. Soc. New South Wales 65: 199 (1932); *Agonis elliptica* C. White & Francis, Bot. Bull. Dept. Agric. Queensland 22: 16 (1920), non *Leptospermum ellipticum* Endl. **Type:** Queensland. MORETON DISTRICT: Beerwah, *W.D. Francis* s.n. (holo: BRI!).

Distribution and habitat: Confined to coastal areas from Rainbow Beach in Queensland to Coffs Harbour in New South Wales. It grows in swampy *Banksia* or *Eucalyptus* forests.

9. Leptospermum trinervium (Smith) J. Thompson, Telopea 3(3): 366 (1989); *Melaleuca trinervia* Smith in White, Voyage to New South Wales: 229, t. 24 (1790). **Type:** New South Wales. [Port Jackson, White] "t. 24, Whites voyage", Sheet 878.11 (top L.H.) herb. Smith (LINN *n.v.*), *fide* J. Thompson, *loc. cit.*

L. attenuatum Smith, Trans. Linn. Soc. London 3: 263 (1797). **Type:** New South Wales: Port Jackson, 1795, *Mr White*, Sheet 878.9, R.H. specimens (lecto: LINN, photo!).

Distribution and habitat: This widespread species extends from Rockhampton, Queensland to the East Gippsland district of Victoria. It grows commonly in dry sclerophyll forest in sandy soils, and also in heathland.

10. Leptospermum lamellatum J. Thompson, Telopea 3(3): 384 (1989). **Type:** Queensland. LEICHHARDT DISTRICT: 21 miles [34 km] SE of Bedourie Homestead, 14 October 1963, *N.H. Speck* 1843 (holo: NSW; iso: BRI!,CANB).

Additional specimens: Queensland. MITCHELL DISTRICT: Sandstone Wall, White Mountains NP, 20°27′S, 145°54′E, Jul 1991, *Cumming* 11257 (BRI). SOUTH KENNEDY DISTRICT: 4 km N of 'Springvale' homestead, west of Clermont, Sep 1990, *Bean* 2375 (BRI,NSW). LEICHHARDT DISTRICT: Strike ridge south of Tomahawk Ck, east of Zig Zag Range, 'Peak Vale' holding, May 1981, *Godwin* s.n. (QRS). MARANOA DISTRICT: beside Redford road, N of Mt Hotspur, near 'Hungry Downs', 26°01′S, 147°30′E, Jun 1990, *Grimshaw* CHR6 (BRI). DARLING DOWNS DISTRICT: 12 km NW of Western Creek Forestry station, via Milmerran, Nov 1989, *Bean* 1166 (BRI).

Distribution and habitat: Endemic to Queensland, extending from the White Mountains N.P., west of Townsville to the Milmerran area in the south of the state. It is found on ridges in shallow sandy soils, usually derived from sandstone.

11. Leptospermum microcarpum Cheel, J. & Proc. Roy. Soc. New South Wales 57: 126 (1923). **Type:** New South Wales. Copmanhurst, November 1917, *E. Cheel* [NSW 154747] (lecto: NSW), *fide* J. Thompson, Telopea 3(3): 379 (1989).

Distribution and habitat: Occurs in coastal areas from Kilkivan in southern Queensland to Grafton in New South Wales, and also extends west to beyond Warwick. It inhabits shallow soils on rocky hills and mountainsides.

12. Leptospermum brevipes F. Muell., Trans. Philos. Soc. Victoria 1: 125 (1855). **Type:** Victoria. Buffalo Creek, 6 March [18]53, *F. Mueller*, MEL 1539307 (lecto: MEL; isolecto: K,MEL), *fide* J. Thompson, Telopea 3(3): 382 (1989).

Additional specimens: Queensland. DARLING DOWNS DISTRICT: Bracker State Forest, S of Inglewood, Dec 1990, *Bean* 2740 (AD,BRI,MEL,NSW); Herries Range, southern end of S.F. 444, south-west of Warwick, Dec 1990, *Bean* 2795 (BRI,NSW).

Distribution and habitat: Extends from the Warwick-Inglewood districts of Queensland, throughout New South Wales, to north-eastern Victoria. It grows in poor forests on rock outcrops and rocky hillsides, especially on granite.

13. Leptospermum neglectum J. Thompson, Telopea 3(3): 383 (1989). **Type:** Queensland. NORTH KENNEDY DISTRICT: 17 km west of Paluma, 9 September 1982, *E.M. Jackes & B.R. Jackes* s.n. (holo: NSW), *fide* J. Thompson *loc. cit.*

Leptospermum sp. 1, Stanley & Ross, Fl. S.E. Queensl. 2: 130 (1986).

Additional specimen: Queensland. COOK DISTRICT: Mount Mulligan, c. 40 km NW of Dimbulah, Apr 1985, *Clarkson* 5916 (BRI,L,MEL,NSW,PERTH,QRS).

Distribution and habitat: Endemic to Queensland and extends from Mt Mulligan in the north to Tiaro in the south. It grows both in eucalypt forest and on rocky hillsides with little soil development.

14. Leptospermum sericatum Lindley in Mitchell, J. Exped. Trop. Australia: 289 (1848); *L. stellatum* forma *sericatum* (Lindley) Domin, Biblioth. Bot. 89: 454 (1928). **Type:** Queensland. LEICHHARDT DISTRICT: near the Pyramids [Mt Playfair district], 5 September 1846, *T. Mitchell* (holo: ?, *n.v.*; topo: BM, photo!).

Distribution and habitat: Confined to sandstone habitats in the Leichhardt district of Queensland, including Carnarvon Gorge, Blackdown Tableland and Isla Gorge. It grows on sparsely vegetated sandstone slopes, often rooting into crevices in the rocks.

15. Leptospermum parvifolium Smith, Trans. Linn. Soc. London 3: 263 (1797). **Type:** New South Wales. Port Jackson, 1795, *Dr White* (holo: LINN *n.v.*), *fide* J. Thompson, Telopea 3(3): 363 (1989).

Additional specimen: Queensland. DARLING DOWNS DISTRICT: Coolmunda Dam, east of Inglewood, Dec 1990, *Bean* 2733 (BRI,MEL,NSW).

Distribution and habitat: The location given above is the only one known for this species in Queensland. However, it is widespread in New South Wales to as far south as the Nowra district. It grows in poor sandy soils on hillsides in dry sclerophyll forest.

16. Leptospermum venustum A. Bean **sp. nov.** affinis *L. semibaccato* Cheel foliis latioribus, ramulis persistenter pubescentibus, floribus majoribus hypanthio longiore, fructibus majoribus interdum 6-locularibus differt. **Typus:** Queensland. BURNETT DISTRICT: 'Melrose' Station, 15 km west of Eidsvold, 14 August 1990, *A.R. Bean* 2112 (holo: BRI, iso: AD,CANB,K,L,MEL,NSW,PERTH,SING).

Spreading shrub, 1.5–2.5 m high, with arching branches; bark rough, grey, scaly, closely adhering, persistent throughout; branchlets with spreading hairs up to 2 mm long, stem flanges absent. Leaves alternate, sessile or with petiole up to 1 mm long, concolourous, green, broadly elliptical, 6–13 × 3–4 mm, 3–5-veined, oil glands numerous, conspicuous; leaf base cuneate, apex acute; young leaves with long marginal hairs, glabrescent. Inflorescence consisting of single flowers, borne on short side-branches; floral bracts red-brown, glabrous, completely enclosing mature buds, shed just prior to anthesis. Flowers 18–25 mm in diameter, pedicels absent or very short, hypanthium silky pubescent, 3–4 mm long; sepals triangular, pubescent; petals deep pink fading to pale pink, orbicular, glabrous; stamens 30–40, all about the same length; anthers versatile, cells about 0.75 mm long, parallel, opening by narrow slits, gland conspicuous, globular, dark-brown;

style slightly inset, stigma capitate; roof of ovary tomentose, ovary 5(6)-locular. Fruits fleshy or succulent when fresh, globular-truncate, 5(6)-locular, 6–7 × 7–8 mm, when dried brown and wrinkled, c. 5 × 6 mm; sepals persistent. Seeds dark brown, obovoid, conspicuously reticulate, c. 1.2 × 0.6 mm. Unfertilised seeds pale yellow, linear. **Fig 1.**

Specimens examined: Queensland. BURNETT DISTRICT: 1 km N of Little Morrow Creek crossing, on Eidsvold to Cracow road, Jul 1990, *Forster* 7000 (AD,BISH,BRI,CANB,CBG,CONN,DNA,HO,K,L,LAE,MEL,MO, NSW,PERTH,PNH,PR,PRE, QRS,US); Eidsvold, *Bancroft* s.n.[AQ 041731] (BRI); 20.9 km from Eidsvold towards Cracow, N side of road, Sep 1985, *Bean* 283 (BRI); 20 km W of Eidsvold, Jul 1989, *Bean* 1103 (BRI).

Distribution and habitat: *L. venustum* is confined to a relatively small area west of Eidsvold where it grows on granitic hillsides and slopes, or beside small watercourses. It grows in eucalypt woodland often dominated by *Eucalyptus petalophylla* Brooker & A. Bean or *E. baileyana* F. Muell. On moister sites, *Lophostemon suaveolens* (Solander ex Gaertner) Peter G. Wilson & Waterhouse may be present.

Flowering period: July – October.

Affinities: *L. venustum* is closely related to *L. semibaccatum*; both species have rather fleshy fruits and silky-hairy hypanthia. *L. venustum* differs from that species by its broader leaves, persistently hairy branchlets, larger flowers and fruits, and longer floral hypanthium.

Conservation status: The suggested status is 2R, as defined by Briggs and Leigh (1988).

Etymology: This species is named for its very beautiful floral display.

Note: Because of its large, prominently displayed pink flowers, *L. venustum* is a very attractive plant, and should be introduced into cultivation. Limited trials by the author suggest that it is adaptable to garden culture.

17. Leptospermum semibaccatum Cheel, J. & Proc. Roy. Soc. New South Wales 65: 203 (1932). **Type:** New South Wales: Wallis Island, Tuncurry, 11 May 1925, *E. Cheel* s.n. [NSW 154729] (lecto: NSW *n.v.*), *fide* J. Thompson, Telopea 3(3): 365 (1989).

Additional specimen: Queensland. PORT CURTIS DISTRICT: Deepwater N.P., 40 km east of Miriam Vale, Oct 1989, *Gibson* TO1860 (BRI).

Distribution and habitat: Confined to coastal areas from Deepwater N.P. to Forster in New South Wales. It is a common component of sandy coastal heathlands.

18. Leptospermum arachnoides Gaertner, Fruct. Sem. Pl. 1: 175, t. 35 (1788). **Type:** the illustration in the above publication, based on a specimen in the Banksian herbarium (BM), *fide* J. Thompson, Telopea 3(3): 428 (1989).

Distribution and habitat: It has a very restricted distribution in Queensland (in the Stanthorpe area), but is widespread in New South Wales. It grows in poorly drained heathland or adjacent eucalypt forests.

19. Leptospermum liversidgei R. Baker & H.G. Smith, J. & Proc. Roy. Soc. New South Wales 39: 124, t. 2 (1906). **Type:** New South Wales. Ballina, March 1905, *D.W. Munro* s.n. (lecto: NSW), *fide* J. Thompson, Telopea 3(3): 395 (1989).

Distribution and habitat: Grows only in coastal areas from Bundaberg, Queensland to Port Stephens in New South Wales. It inhabits sandy or peaty soil, in swampy heathlands.

20. Leptospermum oreophilum J. Thompson, Telopea 3(3): 404 (1989). **Type:** Queensland. MORETON DISTRICT: Ngungun, Glasshouse Mountains, 13 June 1951, *L.A.S. Johnson* s.n. [NSW 154760] (holo: NSW), *fide* J. Thompson *loc. cit.*

Leptospermum sp. 'Glasshouse Mountains', Thomas & McDonald, Rare & Thr. Plants of Queensland 38 (1989).

Additional specimen: Queensland. MORETON DISTRICT: Mt Coolum, 3 km south of Coolum Beach, Jul 1983, *Sharpe* 3334 & *Batianoff* (BRI).

Distribution and habitat: This is a rare species confined to Mt Coolum and to several peaks of the Glasshouse Mountains. It grows on skeletal slopes on these extinct volcanic peaks, in montane heath communities.

21. Leptospermum polygalifolium Salisb., Prodr. 350 (1796). **Type:** juxta Port Jackson [New South Wales], legit *Dav. Burton* (holo: ?K *n.v.*), *fide* J. Thompson, Telopea 3(3): 396 (1989).

L. flavescens Smith, Trans. Linn. Soc. London 3: 262 (1797). **Type:** New South Wales: Port Jackson, 1795, *Mr White* 878.8 (holo: LINN, photo!).

Distribution and habitat: Extends from Cape Flattery on Cape York peninsula in Queensland to south of Sydney in New South Wales, and up to 500 km inland. It grows in a diversity of habitats, including heathlands, rocky hillsides and in dense eucalypt forest.

Note: This is a very complex and variable species. Thompson (1989) recognised six subspecies, and while it is true that some distinct forms do exist, there appears to be widespread intergradation between them. Furthermore, some subspecies, as typified by Thompson, are very similar indeed. For these reasons, I advocate the use of *L. polygalifolium s. lat.* only, until more intensive study is done on the species.

22. Leptospermum variabile J. Thompson, Telopea 3(3): 403 (1989). **Type:** Queensland. MORETON DISTRICT: Mt Gillies, about 20 km SW of Rathdowney on Mt Lindesay Highway, 18 October 1978, *P.R. Sharpe* 2438 (holo: NSW; iso: BRI!).

Distribution and habitat: Occurs on mountains of southern Queensland near the border with New South Wales, and into northern New South Wales. It grows on skeletal hillsides of volcanically-derived mountains, in heathland or low woodland.

Note: While the populations of *L. variabile* from the Macpherson Range and adjacent areas (including the type locality) are distinctive and worthy of recognition, other populations included by Thompson (1989) in *L. variabile* are very difficult to separate from *L. polygalifolium*. In her species key, Thompson has used an anther character to separate these species (couplet 40). However, due to the amount of variation in the anthers of *L. polygalifolium*, it is unwise to rely on this character to distinguish them. My examination of *L. variabile* in the field revealed that it has quite flaky, loosely adhering bark, in contrast to the scaly, tightly adhering bark of *L. polygalifolium*; hence bark may prove to be a better discriminator between these difficult species.

23. Leptospermum novae-angliae J. Thompson, Telopea 3(3): 405 (1989). **Type:** New South Wales: top of Bald Rock Mountain, 15 miles [24 km] north of Tenterfield, 31 March 1962, *E.F. Constable* 2074 (holo: NSW *n.v.*) *fide* J. Thompson *loc. cit.*

Leptospermum sp. 2, Stanley & Ross, Fl. of S.E. Queensl. 2: 132 (1986).

Distribution and habitat: In Queensland, it is known only from the Girraween N.P. near Stanthorpe, where it grows in shrubland on exposed granitic slopes. The species extends to west of Coffs Harbour in New South Wales, in similar situations.

24. Leptospermum minutifolium C. White, Proc. Roy. Soc. Queensland 57: 26 (1947). **Type:** Queensland. DARLING DOWNS DISTRICT: base of Mount Norman via Wallangarra, November 1944, *Mrs M.S. Clemens* (holo: BRI!).

Distribution and habitat: In Queensland, known only from Girraween N.P. and near Christie Target; in New South Wales it extends south to about Armidale. It grows in eucalypt forest, often near watercourses.

25. Leptospermum juniperinum Smith, Trans. Linn. Soc. London 3: 263 (1797); *L. scoparium* var. *juniperinum* (Smith) Domin, Biblioth. Bot. 89: 453 (1928). **Type:** New South Wales: Port Jackson, 1795, *J. White* s.n., herb. Smith 878.17 (holo: LINN *n.v.*), *fide* J. Thompson, Telopea 3(3): 418 (1989).

Distribution and habitat: Extends from Fraser Island in Queensland to Ulladulla in New South Wales. In Queensland it is confined to coastal areas in *Melaleuca* forests, heathlands

or sedgelands, but in New South Wales it reportedly also grows on sandstone escarpments (Thompson 1989).

26. Leptospermum recurvum J.D. Hook, Icon. Pl.: t. 893 (1852). **Type:** Borneo: Kina Balu, abundant, from 7000–8500 feet, whitening the top of the mountain, *H. Low* (holo: K *n.v.*), *fide* J. Thompson, Telopea 3(3): 391 (1989).

Specimens examined: Indonesia. Borneo. Kinabalu National Park, Sabah, Jul 1966, *Weber* 54680 (A,SING); East Pinnacles, Mt Kinabalu, Mar 1964, *Chew & Corner* 5877 (BRI); Gurulau Spur, Mt Kinabalu, Dec 1933, *Clemens* 50616 (A). **Sulawesi.** top of Kamboeno, Jul 1937, *Eyma* 1362 (A,L); Mt Roroka Timbu summit, May 1979, *Van Balgooy* 3323 (L); G. Rantemario, Jun 1937, *Emya* 691 (L).

Distribution and habitat: *L. recurvum* occurs on the upper slopes of Mt Kinabalu in Borneo and on the highest mountains of Sulawesi (Celebes), in shallow soils, in dense shrubland or low forest.

Note: *L. recurvum* has been regarded as being endemic to Mt Kinabalu in Borneo (Merrill 1921; Thompson 1989), but specimens from the higher mountains of Sulawesi are similar to those from the type locality. The leaves of the Sulawesi specimens are not as strongly recurved, and are somewhat thinner, but are otherwise typical. Lee & Lowry (1980) record that on Mt Kinabalu, '*L. flavescens*' [= *L. javanicum*] and *L. recurvum* grow within about 30 metres of each other at Carson's Camp, and that an exhaustive search in this area failed to reveal any morphological intermediates between the two taxa. Therefore it seems that *L. javanicum* and *L. recurvum* are genetically isolated on Mt Kinabalu. Some *L. javanicum* specimens from Sulawesi approach *L. recurvum* in leaf dimensions, and it is not clear whether or not there is a gradual transition from typical *L. javanicum* to *L. recurvum* in Sulawesi.

27. Leptospermum javanicum Blume, Bijdr. 1: 1100 (1826); *Macklottia javanica* (Blume) Korth., Ned. Kruidk. Arch. 1: 196 (1847); *L. flavescens* var. *javanicum* (Blume) King, J. Asiat. Soc. of Bengal 70(2) (1901); Mat. for a Fl. Malay. Pen. 12: 69 (1901). **Type:** Java. in cacumine montis Gede (holo: L!, iso: L!).

Glaphyria nitida Jack, Trans. Linn. Soc. London 14: 128 (1823), non *Leptospermum nitidum* J.D. Hook. **Type:** Gunong Bunko, Sumatra (*n.v.*), *fide* E.D. Merrill, Jack's genera and species of Malaysian plants, J. Arnold Arbor. 33: 226 (1952).

Leptospermum alpestre Blume, Bijdr. 1: 1100 (1826). **Type:** in declivitatibus altioribus montis Gede. (holo: L *n.v.*), *fide* J. Thompson, Telopea 3(3): 390 (1989).

L. floribundum Junghuhn, Java 1: 578 et in Nat. en Geneesk. Arch. Neerl. Indie 2: 37 (1845). **Type:** Java. 'javanicae alpinae' (holo: L!).

Tree to 6 metres high; bark fibrous; branchlets pubescent, stem flanges prominent, expanded and extending beyond leaf-base. Leaves alternate, sessile, strongly discolourous, dark green above, elliptical to obovate, 10–30 × 4–9 mm, midrib impressed above, apex obtuse; young leaves silky pubescent below, especially along margins and midrib, old leaves glabrous. Inflorescence consisting of single flowers borne on short side branches; floral bracts and bracteoles persistent, present around mature buds and shed just prior to anthesis. Flowers 15–20 mm in diameter; pedicels 0–1 mm long; hypanthium silky-pubescent; sepals obtuse, margins densely ciliate; petals white. Fruits woody, conspicuously domed above bowl-shaped base, 5-locular, 4–5 × 6–7 mm, sepals not persisting.

Selected specimens: Burma. Myinmolekat, Mergui district, Jan 1930, *Parker* 3112 (A). **Indonesia. Sumatra.** Gunong Singgalang, Feb 1933, *Holttum* 28106 (SING); Mt Tanggamus, Lampung province, May 1968, *Jacobs* 8233 (A); Mt Losir, Feb 1937, *Steenis* 8569 (SING). **Malaya.** Pahang, Bentong, Genting highlands, Sep 1979, *Bremer* 1613 (A); Mt Uli Kali, Selangor, Malaya, Feb 1969, *Flenley* 4 (A); Padang Luas, G. Tahan, Jun 1923, *Kloss* 12199 (SING); Gunong Benom, Pahang, Mar 1967, *Whitmore* FRI3288 (A,SING). **Java.** Gunong Gedeh, Apr 1938, *Steenis* 10613 (BRI,L). **Borneo.** Mesilau Caves, Sabah, Mar 1964, *Chew & Corner* 4664 (A,BRI,SING); Marai Parai Spur, Mt Kinabalu, Nov 1915, *Clemens* 10934 (A); Bukit Raya, Jan 1983, *Nooteboom* 4610 (A,BRI). **Philippines.** Mt Apo, 7000ft [2100m], near Sulphur spring, Nov 1946, *Edano* 1460 (A); Mt Canlaon, Negros Occidental, Apr 1954, *Edano* 22007 (A); Mt Pulog, Luzon, Mar 1948, *Celestino* 4335 (A,SING). **Sulawesi.** Gunong Rantemario, Feb 1981, *Smith* 681 (L); Pokapin-djang, Jun 1937, *Eyma* 604 (A,L).

Distribution and habitat: *L. javanicum* extends from Burma to western Malesia, including Sumatra, Malaya, Java, Borneo, Philippines and Sulawesi. It is absent from the Lesser Sunda Islands and the Moluccas. It grows at altitudes of between 1500 and 3000 metres,

according to herbarium specimen label data. This is, generally speaking, higher than the altitudes occupied by *L. amboinense.*

Affinities: *L. javanicum* is closely related to *L. recurvum* (see note under that species), and to *L. wooroonooran.* It may be distinguished from *L. wooroonooran* by its pubescent floral hypanthium, larger fruits, and strongly discolourous leaves with an obtuse apex. Some specimens of *L. javanicum* from Sulawesi, e.g. *Whitten* 1985 (L), *Eyma* 604 (A,L), have obovate leaves about 14 mm long, only 1.5–2.0 times longer than broad, and with dense golden hairs on the undersides. This may represent a distinct taxon, but there is presently insufficient material on which to base a decision.

28. Leptospermum wooroonooran Bailey in Bailey & A. Meston, Rep. Exped. Bellenden-Ker: 40 (1889). **Type:** Queensland. COOK DISTRICT: South Peak, Bellenden-Ker, 22 June 1889, *F.M. Bailey* (holo: BRI!).

Additional specimen: Queensland. COOK DISTRICT: Devils Thumb, Oct 1981, *Godwin* s.n. (QRS).

Distribution and habitat: This species is confined to two small disjunct areas of northern Queensland. One is the Mossman Gorge-Devils Thumb-Main Coast Range area west of Mossman, and the other is along the Bellenden Ker range south of Gordonvale. It inhabits high-altitude microphyll 'cloud' forests.

29. Leptospermum amboinense Blume, Bijdr. 1: 1100 (1826); *Macklottia amboinensis* (Blume) Korth., Ned. Kruidk. Arch. 1: 196 (1847). **Type:** Moluccas. Amboina, *collector unknown* (holo: L!).

L. annae Stein in Regel, Gartenflora 34: 66 (1885). **Type:** Mt Apo, Philippines, February 1882, *Dr. A. Schadenberg* (*n.v.*).

L. flavescens var. *angustifolia* Ridley, Fl. Malay Pen. 1: 713 (1922). **Type:** Malaya. Kedah Peak (*n.v.*).

L. petersonii subsp. *lanceolatum* J. Thompson, Telopea 3(3): 394 (1989). **Type:** New South Wales, cultivated Castle Hill [Sydney] from seed ex Herberton dist., September 1965, *C. Debenham* s.n. (holo: NSW!, iso: BRI!).

Tree to 9 m high; bark rough, grey to brown, fibrous, longitudinally fissured, persistent throughout; branchlets glabrous, stem flanges prominent, broad, sometimes extending beyond leaf base. Leaves alternate, sessile, slightly discolourous or concolourous, pale to mid-green, narrowly elliptical, 18–30 × 3–5 mm, midrib scarcely visible, not impressed above; apex acute or obtuse; young leaves with silky appressed hairs on underside, glabrescent. Inflorescence consisting of single (rarely up to 4) flowers borne on short side-branches; floral bracteoles and bracts shed well before anthesis. Flowers 12–18 mm in diameter; pedicels 0–1 mm long; hypanthium glabrous or occasionally pubescent, obconical to hemispherical; sepals obtuse, margins ciliate; petals white. Fruits sessile, woody, conspicuously domed above an obconical to hemispherical hypanthium, (4)5-locular, 3–4 × 4.0–5.5 mm, sepals not persistent on fruit. Seeds and chaff identical, brown, linear, striate, c. 2.0 × 0.2 mm.

Selected specimens: Indonesia. Sumatra. Brastagi, Dec 1930, *Symington* CF25120 (SING). **Malaya.** Gunong Ledang (Mt Ophir), Jul 1969, *Whitmore* FRI12354 (A,SING); Gunong Panti, Johore, Dec 1970, *Shukor* AS1 (BRI); Gunong Jerai (Kedah Peak), Jan 1964, *Burkill* HMB3324 (SING). **Lesser Sunda Islands.** Manau near Ruteng, W. Flores, Apr 1965, *Kostermans & Wirawan* 594 (A,L); summit of Gunong Ranaka, Flores, Mar 1973, *Verheijen* 3359 (L). **Borneo.** Mt Santubong, Sarawak, s.d., *Mjoberg* 238 (A); Summit of Mt Retak, Brunei, Jan 1989, *Wong* WKM820 (SING). **Philippines.** Surigao Province, Apr 1919, *Ramos & Pascasio* 34493 (BRI,NSW); Baklayan, Mt Apo, Mindanao, Nov 1946, *Edaño* 1371 (SING); Dinagat Island, Mindanao, May 1931, *Ramos & Convocar* 84002 (A,SING). **Sulawesi.** South slope of Mt Bonthain, Jul 1976, *Meijer* 11042 (L). **Moluccas.** Manipa Island, May 1940, *Curran* 321 (A); Kp. Waai, Gunong Salahoetoe, Ambon, Oct 1938, *Buwalda* 6207 (A); Kaibobo-Oernitoe, W. Ceram, Feb 1938, *Eyma* 2980 (SING). **Australia. Queensland.** COOK DISTRICT: Hoop Pine area, near McIvor, Sep 1960, *Smith* 11147 (BRI); Big Tableland, near Cooktown, Jul 1952, *Flecker* 14258 (BRI). NORTH KENNEDY DISTRICT: Frederick Peak, 25 km SW of Townsville, May 1991, *Bean* 3205 (BRI); Roma Peak, 40 km S of Bowen, Jun 1991, *Bean* 3364 (BRI,K,L,MEL,NSW,SING).

Distribution and habitat: *L. amboinense* is widespread in Malesia, occurring in Malaya, Sumatra, Borneo, Sulawesi, the Moluccas, Flores and the Philippines. Its altitudinal range in Malesia is 50–2000 metres, according to herbarium specimen label data. In general this is below the altitudes occupied by *L. javanicum* although their altitudinal

ranges certainly overlap. The species also grows in coastal areas of northern Queensland, from Cooktown to Bowen. It inhabits shallow soils, often adjacent to wet sclerophyll forest or rainforest. It is possibly absent from Java, as I have not seen any authentic *L. amboinense* specimens from there.

Affinities: *L. amboinense* cannot convincingly be separated from *L. petersonii* subsp. *lanceolatum* J. Thompson and are thus considered conspecific. The leaf dimensions of Australian material are well within the range of those of *L. amboinense* in Malesia. Similarly, flowers of the two taxa are, on average, the same size and characteristics of their hypanthium, anthers and ovary do not differ significantly. There is no significant difference between the fruits of Australian and Flores material; they are the same size and shape, and in both cases the domed apex is highest away from the style.

L. amboinense is very closely related to *L. petersonii* Bailey, but the latter has been maintained at the species level here, as the two can be separated on leaf and fruit characters. *L. petersonii* has broader fruits with a flat or shallow base when open, and leaves which are usually lemon-scented and have a minutely retuse apex.

L. amboinense can readily be distinguished from *L. javanicum* by its narrower, almost concolourous leaves, usually glabrous floral hypanthium, early shedding bracts and smaller fruits.

Note: A form of *L. amboinense* from Big Tableland near Cooktown is unusual in that it has 2–4 flowers per inflorescence.

30. Leptospermum petersonii Bailey, Queensland Agric. J. 15: 781 (1905). **Type:** Queensland: Wilsons Peak, January 1905, *W.J. Peterson* (holo: BRI!; iso: NSW).

Additional specimens: Queensland. WIDE BAY DISTRICT: Mt Tinbeerwah, 6 km west of Tewantin, Dec 1990, *Bean* 2820 (BRI,NSW); DARLING DOWNS DISTRICT: Red Rock Gorge, near Ballandean, Jan 1940, *Smith* 742 (BRI).

Distribution and habitat: *L. petersonii* extends from Mt Tinbeerwah to near Port Macquarie in New South Wales. It grows on rocky escarpments and watercourses, usually adjacent to wet sclerophyll forest. Thompson (1989) refers to the distribution of *L. petersonii* [subsp. *petersonii*] extending north to Fraser Island. This record is apparently based on a single specimen which is held at BRI. On the label, it is stated that the plant was probably cultivated. Furthermore, the deep sandy soils of Fraser Island would be an unusual habitat for *L. petersonii*, which in Queensland is otherwise confined to skeletal rocky slopes. It is therefore more likely that Mt Tinbeerwah represents the northern limit of the species.

31. Leptospermum gregarium J. Thompson, Telopea 3(3): 411 (1989). **Type:** New South Wales: 10 km from Ebor on Guyra road, 23 July 1981, *J. Thompson* 4196 (holo: NSW *n.v.*), *fide* J. Thompson *loc. cit.*

Additional specimen: Queensland. DARLING DOWNS DISTRICT: Girraween National Park, Portion 125, between Bald Rock and South Bald Rock, Aug 1977, *Grimshaw* s.n. [AQ 438016] (BRI).

Distribution and habitat: Very rare in Queensland, known only from within a few kilometres of the New South Wales border. In the latter state, it extends throughout the northern tablelands and into parts of the western slopes. It grows in high-altitude heathy swamps.

Multi-access key to the *Leptospermum* species of northern Australia and Malesia

Instructions: Select a character. Decide which character state is appropriate for the *Leptospermum* specimen you wish to identify. List the numbers adjacent to that character state. The numbers represent the species as listed in the text. Select a second character, choose the appropriate character state, and list the second set of numbers below the first. Compile a 'current' list comprising those numbers common to both lists. Select a third character, choose the appropriate character state and compare this third set of numbers with the current list. The numbers common to both of these lists becomes the new current list. Identification is achieved when only one number remains. Note that some closely related species pairs cannot always be distinguished using this key. In these cases, it will be necessary to resort to the dichotomous key or species descriptions. Also note that the 'Distribution' character should not be used for cultivated plants of unknown origin.

Character	Character State	Species possessing that character state
Distribution (Queensland	Moreton or Wide Bay	3,6,7,8,9,11,13,17,19,20,21,22,25,30
Pastoral	Darling Downs	3,9,10,11,12,15,18,21,23,24,30,31
Districts)	outside these Districts	1,2,3,4,5,9,10,13,14,16,17,21,26,27,28,29
Stem Flanges	Present	3,4,5,14,20,21,22,23,24,25,26,27,28,29,30,31
	Absent	1,2,6,7,8,9,10,11,12,13,14,15,16,17,18,19
Leaf length	<9 mm	5,11,14,15,16,17,18,19,21,23,24,25,26,31
(largest leaves)	9–15 mm	5,9,11,12,13,16,17,20,21,22,23,25,27,28,31
	>15 mm	1,2,3,4,6,7,8,9,10,12,13,20,22,27,28,29,30
Bark Type	smooth, deciduous	2,3,4,5,6,31
	papery/fibrous, loosely attached	3,7,8,9,10,11,22,31
	fibrous/stringy, firmly attached	1,8,14,15,20,24,26,27,28,29,30
	scaly, not fibrous, closely adhering	12,13,14,15,16,17,18,19,21,23,24,25
Leaf apex	obtuse or minutely retuse	5,6,9,12,13,14,17,19,21,24,26,27,29,30
	acute, not prickly	1,2,3,4,7,8,9,10,12,13,14,15,16,17,20,21,22,26,27, 28,29,31
	acute, prickly	1,18,23,25
Floral hypanthium	glabrous	1,2,3,6,19,20,21,22,23,24,25,26,27,28,29,30,31
	pubescent	2,4,5,7,8,9,10,11,12,13,14,15,16,17,18,19,25,27,31
Fruit diameter	<5 mm	2,3,4,5,6,8,9,10,11,12,13,14,15,26,28,29
	>5 mm	1,7,16,17,18,19,20,21,22,23,24,25,27,28,29,30,31
Number of loculi	Three	2,3,4,5,6,7,8,11,17
in fruit	Four	9,10,11,12,13,15,17,19,29
	Five or more	1,9,10,11,12,13,14,16,17,18,19,20,21,22,23,24,25, 26,27,28,29,30,31
Sepals persistent	Yes	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,29,30
in fruit?	No	19,20,21,22,23,24,25,26,27,28,29,30,31

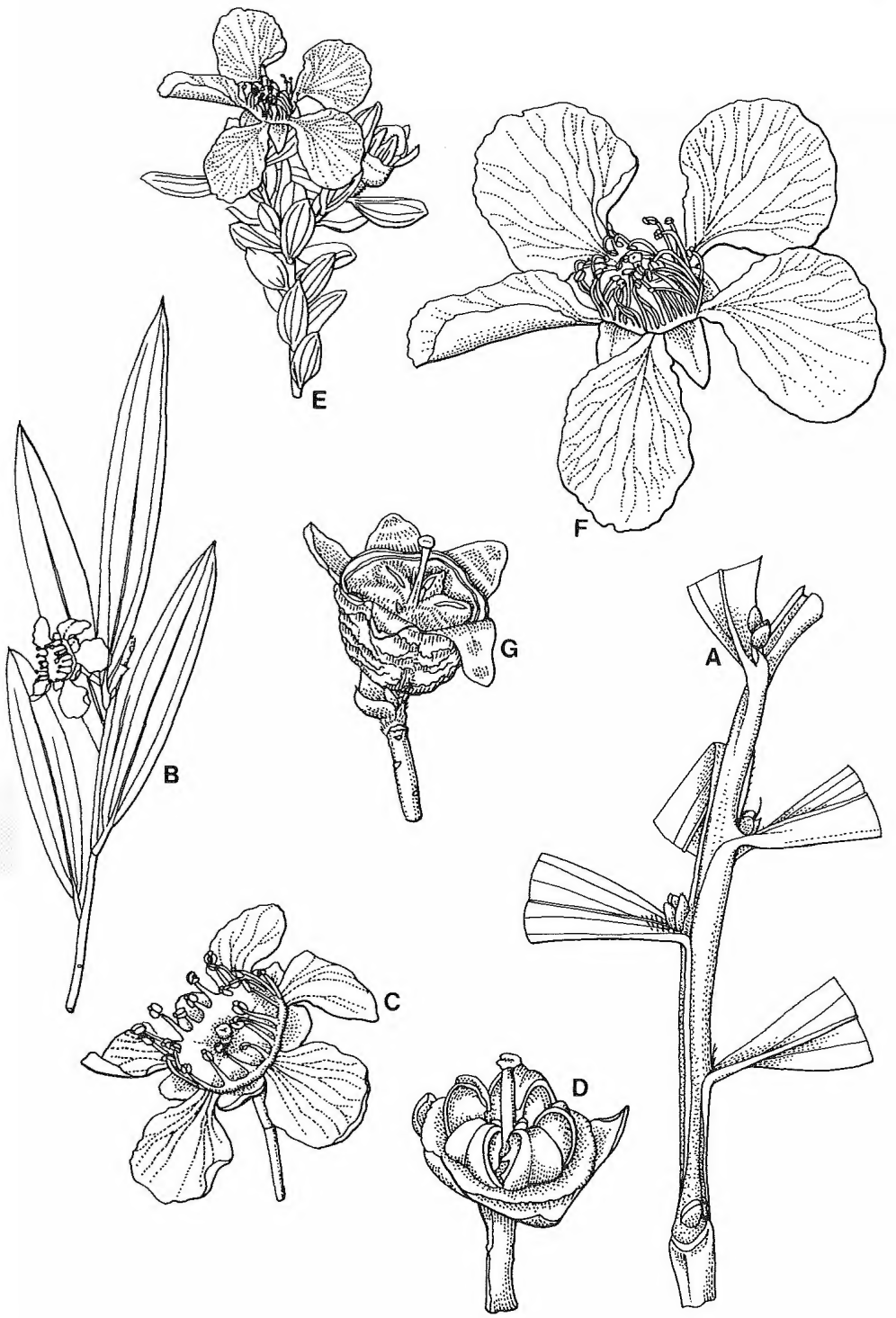

Fig. 1. *Leptospermum petersonii*: A. twig with stem flanges × 6. *Leptospermum pallidum*: B. flowering twig × 1.5. C. flower × 3. D. fruit × 3. *Leptospermum venustum*: E. flowering twig × 1.5. F. flower × 3. G. fruit × 3. A, Thompson 4156; B,C, Bean 1068; D, Bean 2949; E,F Forster 7000; G, Bean 2112.

Dichotomous key to the *Leptospermum* taxa of northern Australia and Malesia

1. Largest leaves more than 18 mm long 2
   Largest leaves less than 18 mm long 16

2. Stem flanges present, conspicuous 3
   Stem flanges absent or scarcely visible 8

3. Fruits <4 mm in diameter, 3-locular, not domed; 3–8 flowers per inflorescence; bark smooth, at least on branches 4
   Fruits >4 mm in diameter, (4)5-locular, domed; 1 flower per inflorescence; bark rough throughout 5

4. Hypanthium glabrous; leaves concolourous; roof of ovary glabrous . . . . . **L. brachyandrum**
   Hypanthium pubescent; leaves discolourous; roof of ovary hairy along valve margins . . . . . **L. parviflorum**

5. Sepals glabrous at anthesis; fruits 7–10 mm in diameter . . . . . **L. variabile**
   Margins of sepals hairy at anthesis; fruits 4–7 mm in diameter 6

6. Leaves 4–7 times longer than wide 7
   Leaves 2–4 times longer than wide 27

7. Leaf apex obtuse or acute; fruits 4.0–5.5 mm in diameter, (4)5-locular, base of open fruit usually hemispherical . . . . . **L. amboinense**
   Leaf apex minutely retuse; fruits 5–7 mm in diameter, 5-locular, base of open fruit bowl-shaped or almost flat . . . . . **L. petersonii**

8. Pedicels >8 mm long . . . . . **L. pallidum**
   Pedicels absent or up to 4 mm long 9

9. Fruits 3-locular; inflorescence 3- or more-flowered 10
   Fruits 4–5-locular; inflorescence 1–2-flowered 14

10. Flowers and fruits in sessile clusters; bark rough 11
    Flowers and fruits in axillary racemes; bark smooth 12

11. Inflorescence 15–20-flowered; leaves 7–11 mm wide, base obtuse **L. speciosum**
    Inflorescence 4–6-flowered; leaves 4–5 mm wide, base cuneate . . . . . **L. whitei**

12. Leaves dark green, apex obtuse; plants growing on rocky hillsides **L. luehmannii**
    Leaves pale green, apex acute; plants growing along watercourses 13

13. Leaves 1.0–4.5 mm wide; fruits 2.0–3.5 mm across **L. madidum** subsp. **sativum**
    Leaves 4.5–9.0 mm wide; fruits 3.5–5.0 mm across **L. madidum** subsp. **madidum**

14. Bark grey, scaly, closely adhering; fruits with a shallow dome, stigma >2 times width of style . . . . . **L. neglectum**
    Bark brown, papery, loosely adhering; fruits without a dome, stigma <2 times width of style 15

15. Leaves 8–15 times longer than wide; pedicels 2–4 mm long . . **L. lamellatum**
    Leaves 4–6 times longer than wide; pedicels 1.0–1.5 mm long . . **L. trinervium**

16. Leaves prickly 17
Leaves not prickly 20

17. Stem flanges present 18
Stem flanges absent 19

18. Leaves 2–3 mm wide; fruits 5.0–6.5 mm long . . . . . **L. novae-angliae**
Leaves 0.8–1.5 mm wide; fruits 3–4 mm long . . . . . **L. juniperinum**

19. Old leaves hairy; fruits 6.5–8.0 mm in diameter . . . . . **L. arachnoides**
Old leaves glabrous; fruits 3–4 mm in diameter . . . . . **L. microcarpum**

20. Stem flanges present, conspicuous 21
Stem flanges absent or scarcely visible 30

21. Largest leaves <6 mm long 22
Largest leaves >6 mm long 23

22. Leaves strongly recurved; margins of sepals hairy . . . . . **L. recurvum**
Leaves not recurved; sepals glabrous throughout . . . . . **L. minutifolium**

23. Fruit not woody or domed, sepals persisting 24
Fruit woody and domed, sepals not persisting 25

24. Bark smooth; fruit 3-locular; leaves 2.5–4.0 mm wide . . . . **L. purpurascens**
Bark rough; fruit 5-locular; leaves 1.5–3.0 mm wide . . . . . **L. sericatum**

25. Bark ± smooth; papery layers shed from hypanthium of fruit . . **L. gregarium**
Bark rough; hypanthium of fruit without papery layers 26

26. Margins of sepals hairy at anthesis; leaves mostly >4 mm wide 27
Sepals glabrous at anthesis; leaves <4 mm wide 28

27. Leaves concolourous, strongly 3-veined, apex acute; floral hypanthium glabrous . . . . . **L. wooroonooran**
Leaves discolourous, not markedly 3-veined, apex usually obtuse; floral hypanthium usually pubescent . . . . . **L. javanicum**

28. Base of open fruit almost flat; leaves 3.5–4.0 mm wide . . . . . **L. oreophilum**
Base of open fruit hemispherical to obconical; leaves 1–4 mm wide 29

29. Bark papery or fibrous, loosely adhering; leaves 13–22 mm long; fruits 7–10 mm in diameter . . . . . **L. variabile**
Bark scaly, closely adhering; leaves 6–15 mm long; fruits 5–8 mm in diameter . . . . . **L. polygalifolium**

30. Sepals not persisting on fruit; leaves lemon-scented . . . . . **L. liversidgei**
Sepals persisting on fruit; leaves not lemon-scented 31

31. Fruit succulent, becoming wrinkled after seed shed, sessile 32
Fruit dry, thin-walled, not wrinkled after seed shed, pedicellate 33

32. Leaves 3–4 mm wide; floral hypanthium 3.5–4.0 mm long; dehisced fruits 5–6 mm long, 5(6)-locular . . . . . **L. venustum**
Leaves 1.5–3.0 mm wide; floral hypanthium 2.0–2.5 mm long; dehisced fruits 4–5 mm long, (3)4–5-locular . . . . . **L. semibaccatum**

33. Leaves 3–5 mm long ..... **L. parvifolium**
Leaves 6–18 mm long 34

34. Valves not projecting above rim of fruit; bark papery ..... **L. trinervium**
Valves projecting above rim of fruit; bark scaly 35

35. Leaves 6–10 mm long; floral bracts persisting to anthesis ..... **L. sericatum**
Leaves 10–18 mm long; floral bracts not persisting to anthesis 36

36. Pedicels c. 1 mm long, fruit dome about half hypanthium length **L. neglectum**
Pedicels 3–4 mm long, fruit dome about equal to hypanthium length ..... **L. brevipes**

Acknowledgements

I would like to thank the Directors of A, DNA, L, NSW, PERTH and SING for the loan of their herbarium material and types, and the directors of BRI, JCT and QRS for access to their herbaria. The Director of the Queensland Herbarium kindly provided working space and processed loans. I am grateful to Will Smith who provided the illustrations, to Les Pedley for the latin diagnoses, to Philip Sharpe for translating the original description of *L. annae*, to Peter and Ann Radke for field assistance and to Estelle Ross who commented on a draft of this paper.

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Accepted for publication 6 February 1992